New Jersey
State Highway Department

Departmental Committee on
Highway Needs in the State of New Jersey

Preliminary Report
by
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A Study of Highway Needs in the State of New Jersey

Preliminary Report

Chapter 1

Scope of Study

On March 5th, 1943, State Highway Commissioner Spencer Miller, Jr. appointed a Departmental committee to re-examine and study from a broad viewpoint the highway situation in the State of New Jersey in relation to the future needs of the whole highway system.

At the present time this system covers about 27,000 miles of highways, of which 1,688 miles form the now operating State Highway System. Approximately 18,600 miles of the highways are in rural areas, and the remaining 8,400 miles, which include city streets, are within the urban zones.

The principal reasons for making this study are to determine the needs of all highways in the State; to outline on a rational basis a State Highway System that will serve the traffic needs from now on to the end of this century; and to provide a foundation for planning of post-war highway work.

The most recent study of a comprehensive State Highway System was made about seventeen years ago, and the conclusions are contained in a report made in 1926 by Major W. G. Sloan, then State Highway Engineer.

For several reasons, the present time is particularly opportune for making this study. At the suggestion of the federal Public Roads Administration, a state-wide planning survey was started in 1938 by the New Jersey State Highway Department in cooperation with and under the general direction of the Public Roads Administration.

The primary purpose of this survey was to ascertain and assemble in comprehensive form complete information regarding the existing roads in New Jersey; their condition; the economic and social status of the territories served by them; the traffic on the road; and the sources and expenditures of all public revenues.

More specifically, there are three general phases of the Planning Survey. The first is a Road Inventory or a listing of the extent and condition of all road systems of the State; the second deals with the relative uses made of the highways; and the third covers the income derived from the operation of the highways and the cost of their construction and maintenance.

This Statewide Planning Survey is now practically completed and the findings are being tabulated. The information and new knowledge obtained from the survey will form the principal source of facts on which the present study will be based.

In addition, the State Planning Board of New Jersey has during the last few years made comprehensive surveys of present natural and human resources in the State in order to suggest measures which may promote orderly development and fuller use of these resources. These surveys as well as the many excellent maps prepared therefrom will form another important source for this study.

Furthermore, during the last few years, many universities, colleges and associations, as well as the State Highway Department itself, have been investigating and reporting on subjects directly related to the development of highways. The Princeton University, for example, has made researches dealing with soil mechanics and other matters of importance to highway construction; and the American Association of State Highway Officials have prepared and published basic policies on various matters relating to highways. All this information will be of great help in carrying out this study.

This Preliminary Report is made to outline the scope and basic structure of the study. It is intended to continue the study on the outlines shown in this report.

Chapter 2

Forecast of Future Traffic

Purpose of Forecast

Future Highway needs are predicated on the extent to which the people will use the highways in the years to come, and this can be anticipated by a critical study of the development up to the present time in regard to certain matters directly related to highway travel.

Population

During the last century, much has happened to affect the living conditions and habits of the people in the State of New Jersey. Fifty years ago, the radio and the airplane were still unknown; the telephone and electric lighting were in their infancy, and the horse and buggy had not yet shown any signs of being replaced by the automobile. During the last fifty years we have passed through two wars and we are now in the midst of a third; there have been several financial booms and depressions; and both the birth and death rates have materially decreased.

It would be natural to assume that these things would have a profound effect on the progressive increase of population in the State, but the records indicate that, except for minor temporary deviations, the increase has been continuous during the last fifty years.

In the year 1890, there were 1,445,000 people living in the State of New Jersey, and in 1940, the number had increased to 4,160,000. If the same average rate should continue, there would be 5,246,000 people in the State by 1960. This figure is somewhat higher than that shown in an estimate made by the Scripps Foundation for Research in Population Problems, which estimate indicates that there will be 4,930,000 people in New Jersey when the year 1960 is reached. Other authorities have arrived at an estimate which is about 160,000 below that of the Scripps Foundation. It is intended to attempt to project this forecast to the year 2000, before this study is completed.

Rural Highway Mileage

Except for some State Highways which have been constructed in new locations, there has been comparatively little increase in the total length of rural highways in the State of New Jersey during the last fifty years. The reason for this is that the State has been in a settled condition for a good deal more than fifty years and has remained approximately in the same condition up to the present time. Of course, the increase in use of motor vehicles has resulted in improvements and occasional relocations of existing roads, but the total mileage of these rural roads has not changed materially. It is likely that this condition will continue to the end of this century.

Highways in Urban Areas

Contrary to the conditions prevailing in rural areas, the length of the street systems in urban places has increased greatly during the last fifty years.

In the four counties of Bergen, Essex, Hudson and Union, which are within the metropolitan area of New York, the aggregate population has risen from 651,000 to 2,227,000 within the last 50 years. Similarly, the population of Camden County, lying within the metropolitan area of Philadelphia, has increased from 87,000 to 256,000 during the same period. In both these areas, it would be natural that the street mileage would have increased to keep pace with the increase in population.

What will be the future trend in these urban zones? Some areas within them are so densely populated already, that they will be able to absorb only minor increases. Nevertheless, people will undoubtedly continue to seek places in which to live outside of the confines of the big cities.

The natural conclusion is that the urban areas will be further extended. In the New York metropolitan area, the counties of Bergen, Essex, Hudson and Union may be fully urbanized, and large parts of the neighboring counties of Middlesex, Morris, Passaic and Somerset may be well within the urban area. Similar conditions will prevail within the metropolitan area of Philadelphia, particularly when much needed additional trans-river highway connections are provided between Philadelphia and the adjacent counties in New Jersey. It is possible then that not only Camden County, but also parts of Gloucester and other counties will be urbanized.

Although it is not a matter that comes directly within the scope of this study, it is to be hoped that during the process of urbanization timely thought will be given to the retaining of sufficient open spaces for recreation and play grounds, for instance such places as the still unoccupied parts of the Hackensack Meadows and other recreation sites suggested by the New Jersey State Planning Board.

Motor Vehicle Registration

Previous records of the number of motor vehicles registered in the State of New Jersey provides a guide for the forecasting of the number that may be registered in the years to come.

The registering of motor vehicles in New Jersey started in New Jersey in 1906, and 13,759 vehicles were registered that year. During the following years the number of registered vehicles rose at a slowly increasing rate to 227,737 in the year of 1920, but during the next ten years the increase was rapid and the number had risen to 852,703 in 1930. For the next three years, the financial depression affected the registration to the extent that in 1933 it was only about 4000 vehicles above that of 1930. Between 1933 and 1941 there was another fairly rapid rise, so that the registration in 1941 amounted to 1,196,209 vehicles. Since that time, the increase has come to a stop on account of the present war conditions.

As a whole, the registration of motor vehicles has increased at a rate much greater than that of the population. For the purpose of comparison, let it be assumed that the average size of a family in New Jersey is four persons. On that basis, only one in every nine families owned an automobile in 1915, while in 1940 on the average, approximately each family had a car. Of course, this large increase in the number of motor vehicles registered as compared with that of the population cannot continue. Evidently, there must be a saturation point beyond which no more vehicles can be absorbed by the population. What the saturation point is is problematic and will depend on various other conditions.

In less densely populated parts of the country, where the privately owned automobile is about the only, or at least the most practical means of getting from one place to another, it is possible that the saturation point may not be reached until the number of automobiles is close to that of every ablebodied adult. This would mean about one vehicle to each two persons within the rural areas. In more densely populated places, where other means of travel exist, and where crowded streets interfere with satisfactory use of the car, the same ratio would probably be more nearly 1 to 3.5. On this basis the saturation point for the State as a whole may be reached when there is about one motor vehicle to each three persons in New Jersey. Taking into account the present war conditions, this point may be reached within the next ten or fifteen years.

The above ratio is predicated on the assumption that a sufficient number of people can afford to buy and maintain their cars, and this is quite possible. After the war, it is probable that most automobiles will be lighter than those now used, they may cost less, and they may be able to run some forty miles on a gallon of gasoline.

On the other hand, we must not be as shortsighted as we were in the earlier days of the automobile era, and not consider the possible effect of aviation on the use of automobiles. It is certain that in the coming years, much of the travel which is now being done over the highways, will be replaced by air travel. Where the travel distance is fifty miles or over, and possibly for even shorter distances, not only people but also freight in increasing volume will be carried by air rather than over the highways. However, this may not affect materially the number of vehicles in use, but rather the distance they travel. Even at the present time, most trips made by motor vehicles are short, and for short trips it is not likely that the automobile will be replaced by the airplane. When they can afford it, people will provide themselves not only with a car for short trips, but also with an airplane for longer journeys, and if they do not own an airplane, they will take the longer trips by commercial planes, perhaps taking with them their car to use at the end of their journey.

Traffic

The forecasting of future population and of the number of vehicles that may be in use in the coming years provides some of the steps necessary to take in order to forecast the traffic which will be on the highways of New Jersey during the coming years. To complete the forecast, we must attempt to determine how far each vehicle is likely to travel, and the records of gasoline consumption during the past years will form a guide in this determination.

For some years prior to 1925, the average annual gasoline consumption per motor vehicle remained quite uniform, and the amount of gasoline used indicates that the average distance traveled by each car was about 5,600 miles during one year. After 1925, there was a sudden rise in the average gasoline consumption per vehicle, indicating that the average travel distance has increased to 7,800 miles per year at the end of 1929. This rise in annual mileage was probably due partly to improved year-round road conditions and partly to improved travel comfort during the winter months. Before that time it was quite customary to lay up the car for the winter, but when the closed car type with heating facilities became more common, and the roads were kept free from snow, people began to use their cars more frequently during the winter months.

Between 1930 and 1941 there has been a gradual increase in the distance traveled as indicated by the annual gasoline consumption, and during the last few of these years the average travel distance per vehicle per year appears to have been about 10,500 miles.

Actually, of course, there is a great variation in the annual mileage of individual motor vehicles. Trucks and buses, as well as many passenger cars used by salesmen and other business people may travel more than twice or three times as far as the average distance. Conversely, many more will travel distances well below the average. Supposing, for example, that 20 per cent of all motor vehicles in New Jersey traveled an average distance of 20,500 miles per year, the remaining 80 per cent would average distance of 8000 miles per year. This last figure probably represents fairly well the average annual distance traveled by privately used automobiles.

While in the future some of the longer trips may be made over the air lanes, these longer trips cover only a small percentage of the total distance traveled by an average car during the year. On the other hand, the average annual travel distance may continue to increase, although there must be some limit to this distance. Additional study is required to estimate this limit.

At the present time it may be fair to assume that, by the year 1960, the average annual distance traveled by a motor vehicle will be not less than 10,500, and not more than 12,000 miles.

Total Annual Traffic

On the basis of the discussion above, the total annual traffic in the year 1960 may now be estimated. It has been shown that the population of New Jersey at that time may be expected to be about five million people, and that the number of vehicles may be about one-third of that of the population. This means that there may be 1,700,000 motor vehicles in the State in the year 1960. It is further shown that the average annual distance traveled by each vehicle may lie between 10,500 and 12,000 miles. Consequently, it may be expected that the total distance traveled on the highways in New Jersey in the year 1960 will be from 18 to 20 billion miles, as compared with a little more than 12 billion miles in 1941.

Further study is needed to make an estimate of the traffic at the end of this century.

Future Highway Needs

It has been shown above that during the last two or three decades, there has been a phenomenal growth in motor vehicle traffic. On account of this, the State Highway Department as well as the highway departments of the local governments have been taxed to their limits during this time to provide even the barest necessities for the traveling public; and for the latter half of this period they have been further handicapped by a diversion of a considerable part of the funds, specifically set aside for highway improvements, to other unrelated uses. The result is that at the present time much is left undone that should have been done to the detriment of the social and economic welfare of the people of New Jersey.

Nevertheless, there is a ray of hope. It seems that within comparatively few years, the previous excessive growth in motor vehicle traffic may gradually diminish and may be followed by a more normal growth, governed largely by the increase of population.

Therefore, if we during the next few years are able to complete the highway system to such an extent, that it by that time will fully serve the then present needs of the public, the future needs may be met from year to year without excessive strain on the economic resources of the people. The contemplated post-war highway work should be planned to make this possible.

Chapter 3

Highway Needs

Standards

In order to establish the needs of the highways of New Jersey, it is necessary, first to determine what the highways should be like in order to require no improvements, and then to compare these perfect highways with those that exist.

It is necessary, therefore, to establish certain norms or standards for this comparison. Fortunately, much research has already been carried out by competent bodies and individuals for the purpose of establishing such standards. The American Association of State Highway Officials, for example, has issued certain "Policies" on various items relating to proper highway construction. The Public Roads Administration has published several papers relating to the same matters, and many others, including the New Jersey State Highway Department, have contributed valuable information on this subject. As most of these discussions are of a general nature, further study will be needed to apply them to the highways of New Jersey.

Some of the items which it is intended to study in order to establish suitable standards are:

1. Width of pavement for 2-, 4-, and 6-lane highways
2. Width of shoulders
3. Graded width of highways
4. Width of Right-of-way
5. Gradient of slopes in fills and cuts
6. Sidewalks
7. Number of traffic lanes in relation to traffic volume
8. Roadway gradients
9. Sight distance
10. Curvature
11. Type of pavement in relation to traffic volume
12. Cross-section of highway
13. Method of traffic movement at crossing highways
14. Truck and bus traffic
15. Lighting of highways
16. Direction signs
17. Numbering of highways

The establishment of standards for most of these items is largely a matter of engineering research. However, some of them involve in greater or less degree the adoption of policies, some of which are already applied by the Highway Department. These items will be discussed below.

Three-Lane Highways

In the list of items above no mention has been made of three-lane highways. Several years ago, a good many three-lane roads were constructed all over the country, where traffic conditions required more than a two-lane highway. Although the traffic capacity of a three-lane highway is much greater than that of a two-lane road, further construction has been largely discouraged on account of the added danger to traffic on a three-lane highway.

In New Jersey, many previously constructed three-lane highways have already been converted to four-lane roads, and no three-lane highways should be constructed in the future.

Width of Right-of-Way

In some cases, where new highways have been laid out and constructed on new location, it has been found necessary within a few years to widen the roads to serve the increasing traffic, and this means that frequently additional right-of-way had to be acquired. The cost of the original right-of-way, which was through open country, was comparatively low. By the very presence, however, of the new highway, the abutting property often increased greatly in value, and when it was necessary to widen the highway, the additional land had to be purchased at a largely increased cost.

In the future, careful study and intelligent vision should be applied to insure that sufficient width of right-of-way is obtained at the inception of a new road project. The highway can then be completed by stage construction.

Stage Construction

By Stage Construction is meant the progressive furnishing of sufficient highway facilities within the limits of a right-of-way acquired at the beginning of the construction of a new highway. This, of course, involves the acquisition of the full width of right-of-way at the start of the project. The road may then be laid out on this right-of-way as may be considered necessary for the ultimate requirements, but it is necessary only to construct so much at the beginning as may be required to serve the immediate needs. Then, as traffic increases, additional facilities can be added without the necessity of destroying and replacing those already built.

Slopes

Usually an earth slope will stand up on a gradient of 1.5 horizontal to 1 vertical, and until recently it has been the practice to use such a gradient on highway slopes in cuts and on fills. However, where the slopes are covered with grass or otherwise landscaped, it has often been found difficult to maintain satisfactorily the plantings on such steep slopes. Easier slopes of 2 to 1, or even 3 to 1 may be found preferable both from an esthetic and economic point of view.

Sidewalks

In 1941, 472 pedestrians were killed and 6,219 were injured by motor vehicles in the State of New Jersey, and these figures are typical of what happens year after year. Forty-two per cent of the fatal accidents occurred on rural roads.

In order to reduce the killings and accidents as much as possible, as well as to ease the strain on the drivers of motor vehicles, it is intended to study the economic advisability of providing sidewalks on rural highways.

Direction Signs

On the State Highways as well as on many roads under the jurisdiction of local governments, there are direction signs to assist the drivers of motor vehicles in following the proper route to their destination. It is intended to study the matter of direction signs in an attempt to coordinate and improve the systems now used throughout the State.

Numbering of Highways

Recently the New Jersey State Legislature has authorized the State Highway Commissioner to renumber the State Highway Routes. It is intended to study this matter, not only as it may concern this State, but also in relation to the numbering used or proposed in adjacent States, as well as in relation to the numbering used on United States Highway Routes.

Condition of Existing Highways

It has been stated above that, in order to determine the highway needs of the State, we may compare the desired standards with the actual conditions.

Records of the actual conditions have been made by the State Planning Survey and will all be available as soon as the necessary tabulation has been completed. From records already tabulated and from information received from other sources, however, a picture may now be obtained of some of the needs of highways in the State of New Jersey.

Present Highway Bridges

Modern bridges are being designed to carry safely a loading of 20-ton trucks. Although at the present time bridges are not often subjected to such a loading, it may be more frequent in the coming years. A 10-ton loading is quite common at the present time.

A survey has been made recently of bridges carrying highway traffic in the State of New Jersey. The survey was limited to bridges having a span of more than twenty feet and located outside of urban areas. The survey has shown that out of a total of 2272 bridges surveyed, 717 were not able to carry safely a 10-ton loading. These bridges should be replaced with new bridges capable of carrying a 20-ton loading.

In addition to these 717 bridges, there are 704 other bridges which are too narrow for present day highway standards. These bridges should be widened.

No survey has been made as yet of bridges in urban areas or of bridges less than 20 feet in span, but it is evident that many of these also must be deficient.

Highway and Railroad Crossings

Probably there are more than 2700 places in the State, where highways are crossed at grade by railroads. In the majority of cases, the traffic on either the railroad or the highway or both is so light that a grade separation is not warranted at the present time. However, many separations are needed within the next few years.

From estimates made in 1935 by the New Jersey Public Utilities Commission and corrected to date, there are 157 grade crossings in the State that are worthy of prompt attention. In addition, there are on State Highways 17 present railroad bridges over highways and 11 highway bridges over railroads which are reported inadequate and in need of reconstruction, and similar conditions exist on other highways. The inadequacy is due to dangerous alignment of the highways and similar causes.

Delaware River Bridges

Apart from the bridges discussed above, there are 18 highway bridges across the Delaware River, which are jointly owned by the States of New Jersey and Pennsylvania, and under the jurisdiction of Delaware River Joint Toll Bridge Commission. With one exception, all of these are free bridges.

According to the records, twelve of these bridges have a roadway width of less than 20 feet; nine of the twelve bridges are not allowed to carry a 10-ton truck; and four have a clearance height above the roadway of less than 14 feet. As these bridges are part of the highway systems, consideration should be given to their reconstruction so as to enable them to conform to present day bridge standards.

Improvements of State Highway System

The needs of the present operating State Highway System involve principally such items as grade separation at crossings with other highways and railroads, reconstruction of present roadways necessary to provide divided highways, the construction of relief roads, and landscaping.

In addition, the needs of the State Highway System include the construction of the already legislated routes as well as of other new routes as discussed more fully in the following chapter of this report.

Improvements of Other Highways

When the records of the Statewide Planning Survey are tabulated, it is intended to compare the present conditions of the highways in the State not included in the present State Highway System with the desired standards for such highways. It is hoped to obtain the collaboration of the County Engineers and other local officials in carrying out this study.

Precise Survey

For some years there has been in progress a State wide precise survey establishing monuments and benchmarks tied in to the coordinate system of the Coast and Geodetic Survey.

The advantage of this survey to the State Highway Department is that the exact location of the center line of the highways in the State, as well as of their boundaries may be firmly and permanently established, and from the standpoint of Defense, the survey is of first importance. It is proper that this survey be continued.

Finances

The finished study should include a complete investigation into the finances, not only of the State Highways but of all the highways in the State, so as to make it possible to present a recommendation for an equitable distribution of the funds collected from the people of the State for highway purposes, and for a businesslike and economical expenditure of this money.

The tabulated records of the Statewide Planning Survey will furnish most of the data needed for this investigation, but the assistance of the proper financial experts will be needed to carry out this part of the study.

Chapter 4

A Rational State Highway System

Legislated State Highway System

The first comprehensive plan for a State Highway System, for which substantial funds were provided, comprising about 596 miles of highways, was adopted by the New Jersey State Legislature in the year 1917. Ten years later, this system was revised by the Act of 1927, which provided for a total of 1871 miles of highways. Subsequently, the Legislature from time to time has added more routes to the legislated Highway System, and at the present time it covers some 2306 miles, of which 1688 miles form the present operating system. The remaining 618 miles have not yet been taken over by the State Highway Department, principally on account of want of money to carry out the necessary improvements. The lack of funds has been due largely to diversion by the Legislature of monies, collected from the people of the State for the purpose of building highways, to other unrelated purposes.

The State Highway System as now legislated may at any time be extended by the Legislature and furthermore, the Highway Act of 1927 provides: "that the Commission (now Highway Commissioner) may lay out, open and improve new roads, over acquired rights-of-way, and may also lay out routes in continuation of, connecting with, or in addition to the routes above specified".

From the above it is evident that the present limits of the State Highway System are quite flexible and may be extended whenever warranted.

It is to the credit of the New Jersey State Legislature that, to all intents and purposes, the 618 miles of State Highways not yet built have been wisely selected and, when built or improved and taken over, they will add greatly to the general welfare of the people in the State of New Jersey.

Extent of State Highway System

In several States, not so far from our own borders, there has developed within the last few years a trend toward including in their state highway systems an essential part of all their highways. The States of Delaware, North Carolina, Virginia and West Virginia have already included in their state highway systems practically all the roads in their respective states; the Commonwealth of Pennsylvania has incorporated in its system some 42,000 miles of highways, representing about 40 per cent of the total highway mileage in the State; and in Maryland it is recommended to include in the State Highway System all rural roads that carry more than 25 vehicles a day, or practically as little as one vehicle an hour.

Shall New Jersey follow this trend? Unfortunately, we cannot readily be guided in this respect by what is done in other states, because our traffic volume is so different from that elsewhere. For example, in Maryland not more than 15 per cent of the present state highway system carried 2,000 vehicles per day; in West Virginia less than 6 per cent of the primary state highway system carries that much traffic, and in Kansas less than 5 per cent of the State highways carries so many vehicles per day.

In comparison, more than 90 per cent of the total mileage of the present operating New Jersey State Highway System carries over 2,000 vehicles per day; in fact, the daily average per mile on all of the State Highways in New Jersey is approximately 6,300 vehicles.

The above figures indicate that, as a whole, the traffic on the New Jersey State Highways is far greater than on the State Highways of these other States and, incidentally, this explains why in some cases the cost per mile of our highways appears to be higher than that of other states.

The figures also indicate that we in this State have been ultra conservative in delineating our State Highway System. This, however, is natural because on account of the fast developing traffic, the endeavor has been to take care of the highways carrying the heaviest traffic, and it had to be done with limited and depleted funds.

In favor of including all highways (except city streets) in the New Jersey State Highway System it has been said that there would be greater uniformity in construction and maintenance; that the cost of maintenance would be reduced; and that it would tend toward greater efficiency and economy. It is also pointed out that all roads and bridges outside of the State Highway System, built with financial aid from the State, are subject to inspection and control by the State Highway Department from the inception to the finish of the work, and that, therefore, it would be more economical for the State to have complete control.

On the other hand, over the years since 1891, the principle of State Aid - first to counties, and later to townships - has become rooted and established in New Jersey. Under the guidance and direction of the State organization, the County Road Departments and the offices of the County Engineers have developed and have functioned satisfactorily. It is proper that this principle of State Aid be continued and that full use be made of these county establishments as well as of existing township facilities, at least until the Legislature may find it appropriate to change the present concept of highway management in the State. However, it is evident that the State Highway System should be extended to serve present as well as future needs.

Outline of State Highway System

In the past, State Highways have essentially been built as through traffic and heavy traffic routes.

To most people, the term through traffic probably will be associated with long distance traffic. It may be of interest to note that there is comparatively little long distance travel. According to figures published in 1939 by the United States Government and based on a survey made by the Bureau of Public Roads, covering the States of Florida, Kansas, Louisiana, Minnesota, New Hampshire, Pennsylvania, South Dakota, Utah, Vermont, Washington and Wisconsin, more than 80 per cent of all trips made by motor vehicles are less than 20 miles in length, and only about 1.5 per cent cover a distance of more than 100 miles. In our neighboring State of Pennsylvania, the average length of all trips was found to be $13\frac{1}{2}$ miles, and for all the eleven states mentioned above, the average trip is recorded to be a little more than 15 miles in length. There are no corresponding figures available for the State of New Jersey, but they cannot vary materially from those of other States.

However, although most trips may be short, the construction and maintenance of routes, connecting distant points in New Jersey, is the natural function of the State, whether or not the traffic volume is heavy. It is also its natural function to provide and maintain roads over which non-local travel is so heavy that it adds materially to the financial burden of the local people.

Generally speaking, it appears that it has been and remains the desire of the people of New Jersey that the State Highway System should consist of a network of highways, over which they can travel as directly as practicable from where they are to where they want to go without undue burden on local finances.

It is on this basis that a rational outline is made in the following of a future State Highway System, which should be substantially completed within the next twenty or twenty-five years, and which should serve the needs of the State to the end of this century.

Key Points

Although the population of New Jersey is spread all over the State, it is by no means uniformly distributed, and the greater part lives in closely populated communities of varying size. If we select all the communities which have at the present time a population of approximately 2,500 or over, and include all county seats, it is found that there are about 180 such places or keypoints in the State, and that their total population represents 80 per cent of that of the entire State. A network of highways connecting these keypoints in such a manner, that any keypoint may be reached thereover from any other keypoint along the shortest practicable route, will properly form the primary outline or skelton of the State Highway System.

The reason for selecting places with a minimum of approximately 2,500 population as the keypoints has a purely practical basis. If a lower figure had been chosen, there would be so many keypoints that the network would become unworkable, and with a higher limit the meshes of the network would be too large. Furthermore, it has been indicated before, that four out of five people in the State live within the keypoints selected and, naturally, a good deal more are living close to the highways that connect the key points.

Heavily Traveled Roads

In the following, it is tentatively assumed that all roads carrying an average daily traffic of more than 500 vehicles, a large part of which is non-local, are heavily traveled roads and for that reason should be included in the State Highway System. As heavy travel largely occurs between the centers of population, many of these roads either will be in the keypoint system of State Highways above described, or will be materially relieved of non-local traffic by new highways required for this system. The remaining heavily traveled roads which do not directly form part of the key system, however, should also be included in the State Highway System.

Although the figure of 500 vehicles, tentatively used above, appears to provide a practical basis, further study is needed to determine whether or not it should be enlarged or decreased.

Recreation Points

So far in this report, emphasis has been given principally to places where people live and work. However, people also will want to go to places where they may rest and play, and there are many such places in the State of New Jersey.

Practically the whole shore of the Atlantic Ocean from Sandy Hook to Cape May, covering a distance of more than 120 miles, is a favorite playground and resting place, not only with the people of New Jersey, but also with those of many other States. The mountain and lake country in the northwesterly part of the State is another popular place for rest and recuperation. Throughout the State, both in its northerly and southerly parts, are many State Parks, and the New Jersey State Planning Board has pointed out that there are many more prospective sites for parks. Some of these are still undeveloped, but all of them are desirable as recreation centers. The shore of the Delaware River from Trenton to Port Jervis with its ever changing vistas provides beautiful scenery, which should be made more accessible than it is at the present time.

The State Highway System should be delineated so as to serve all these places in such a manner that all people within the State have equal opportunity to enjoy the advantages of these vacation places, so bountifully placed at our disposal by Nature.

Highways of Other States

Returning to the workaday use of highways, it is evident that the State Highway System should not be so self-contained that it is concerned only with the immediate requirements within the State. It should provide also suitable connections with all of the more important roads of other States adjacent to the boundaries of New Jersey. In fact the boundaries should be forgotten insofar as the location of inter-state routes are concerned.

Except to the north, the State of New Jersey is bounded entirely by water. At the present time there are 25 bridges and 2 tunnels crossing these waters and carrying highway traffic between New Jersey and the adjacent States. In addition, several ferry lines provide trans-river connections for highway traffic. Along the northerly boundary line several New Jersey highways connect with those of the State of New York. By far the greater number of these present highway connections should be served directly by the State Highway System.

Besides the highway connections with other States which are now in operation, others have been contemplated during the last few years. They include (a) a bridge across the Raritan Bay to Staten Island; (b) a ferry across the Delaware Bay to the State of Delaware; (c) a tunnel across the Delaware River some 35 miles below the Camden Bridge; (d) a similar tunnel about 10 miles below the Camden Bridge; and (e) one or two bridges across the Delaware River between Trenton and Washington's Crossing. All of these prospective connections should be considered in laying out the State Highway System.

Ports and Terminals

Most people traveling by sea, rail or air will start and finish their journey over the highways. Much of this travel may be purely local, but the principal stopping places for ships, trains and aircraft are in fact all main sources of highway passenger and trucking traffic. There are several such places, but most conspicuous is perhaps the waterfront of the lower reaches of the Hudson River, where many railways and steamship lines have their terminals.

Suitable connections should be made between these principal stopping places and the State Highway System.

Metropolitan Urban Areas

It has been stated above that there are about 180 communities which may be taken as the keypoints of the State Highway System. In the metropolitan areas adjacent to New York and Philadelphia, many of these keypoints are close together and their streets merge into continuous thoroughfares. From the point of view of those who travel, whether to, from or through such places, it is generally immaterial through which municipality the roads may lead as long as they go in the direction it is desired to travel. At these places, therefore, the problem does not necessarily involve the provision of State Highways to each individual keypoint. It involves rather the provision of sufficient roads with sufficient capacity to carry all the traffic to and from the points and in the direction in which it desires to travel.

Within these urban areas, the furnishing of travel facilities involves a number of complex, but generally purely local problems, such as provision of parking spaces, traffic signals and one-way streets, policing and directing traffic and many others, all of which are under direct control of the local governments. The provision of travel facilities for local traffic within urban areas, therefore, cannot readily be within the scope of the State Highway System, even though the traffic may be heavy and congested, but must be the function of the local governments.

On the other hand, it is the proper function of the State Highway System to provide suitable highways for those who desire to enter, leave or pass through these densely populated areas. These highways should be of sufficient capacity to carry the traffic that may desire to use them; they should be sufficient in number to serve properly all the people within the urban area; and they should be built so that there is no interference between highway and local traffic.

It is costly to provide such highways through urban areas, and for that reason they are likely to be left unbuilt even after the need for them has become imperative. In the meantime, the areas through which they are to go are being built up more and more and it becomes increasingly difficult to carry through the highway except at heavy cost. For that reason, it is advisable to look well ahead to determine what highways may be needed in such areas, not only now, but in the future, and to secure the right-of-way for them as soon as opportunity occurs.

State Institutions

At various places throughout New Jersey are located State Institutions, caring for specific needs of the public. It is, of course, necessary that suitable access be maintained at all times to these places. Quite properly the main roads within the grounds of the institutions are now being maintained by the State Highway Department, and it is proper also that the access roads outside the grounds should form part of the State Highway System.

Industries

The present trend in industry points to a decentralization of location. More and more, factories, shops and plants move away from urban areas and locate at places where transport facilities are less congested and where there is room for future expansion. At such places, where thousands of people may be employed and from and to which much material is being moved over the highways, it is proper to make suitable connections to the State Highway System.

Agriculture

Land suitable for farming is found in all parts of the State, but is most plentiful in the central and in the westerly half of the southerly part. It is, of course, not practicable nor necessary for the State Highway to serve directly every farm, but it is believed that, with the State Highway System laid out as above described, practically every farm will have adequate access to all parts of the State.

Mining

Apart from the mining now being carried out in the clay deposits along the lower reaches of the Raritan River, in some ore deposits in the northwesterly part of the State and in glass and moulding sand deposits in the southerly part, little mining is being done at the present time in the State of New Jersey. Although some low grade ore is found at various parts of the State, which may become of value as the art of metallurgy is developed, this does not appear to be of sufficient importance to be considered in laying out the State Highway System.

Fishery

Commercial fishing is being carried out along the shore of the Atlantic Ocean as well as in the Delaware Bay. The volume of highway traffic originated thereby is not sufficient to warrant the presence of State Highways beyond those already in existence or contemplated for other reasons.

Forestry

The relation of the State Highway System to public park land, including State Forests, has been described above. More directly in connection with forestry, it may be added here, that the broad clearings through the forests required for the State Highway System will form effective fire breaks, and that the presence of highways through the forests will enhance the efficacy and safety of fire-fighting crews and equipment.

Inland Waterway

During the last few months, the matter of constructing a ship canal from a point on the Raritan River below New Brunswick to a point on the Delaware River below Trenton has been discussed widely, and from a purely theoretical point of view, it might be useful to have such a canal. However, many competent authorities have expressed weighty practical objections to the proposed canal, and these objections would appear to outweigh greatly the advantages of the canal. The objections principally refer to spoiling of rich farmland by lowering the ground water level for miles on each side of the canal; to the loss of all the water from nearby watersheds, if the canal is built above sea water level as now contemplated, which soon will be needed for domestic purposes; and to disorganization of the highway system in the vicinity of the canal.

As a partial substitution for this canal, it has been suggested to dredge a channel through the present waterway lying between the almost continuous sandy keys forming the coast line of New Jersey and the mainland westerly thereof. If such a channel were constructed, the dredged-out material could be deposited on the swamp land on the easterly side of the channel and form the foundation for a desirable coastal highway, which would have definite recreational values of its own. However, in laying out such a highway, great care should be exercised so as not to interfere with present recreational values of the shore front.

Reclamation of Marsh Land

On the New Jersey side of the Delaware River from the southerly part of Salem County through Cumberland County and into the central part of Cape May County, the land fronting the river is generally rich. Formerly, it was protected by dikes, but it is now practically useless marsh land because of recurrent flooding at high water. This land can be reclaimed by the construction of levees or dikes with suitable flood gates along the river front. The dikes could be constructed from material continually being removed from the nearby ship channel and would form the foundation for a useful as well as scenic highway along this part of the Delaware River.

Length of State Highway System

The present operating State Highways, as well as practically all of those legislated but not yet taken over, will fall within a State Highway System as outlined above. The total length of this system is tentatively estimated at not less than 4,500 miles, which includes most of the 2,306 miles in the present legislated system.

The construction of this Highway System may be gradually completed within the next two or three decades, and the whole concept of the System is sufficiently elastic to permit the inclusion of other roads at any time when desired or warranted.

Physical Characteristics

The discussion above has dealt principally with the location of highways without reference to their width, type of pavement and other physical characteristics. As the traffic on the individual highways may vary from less than one thousand vehicles a day to that of the full capacity of a four- or six-lane road, the physical characteristics naturally will not be the same on all the roads in the State Highway System. Prior to its design, each road should be carefully studied to determine the progressive and ultimate volumes of traffic that may come upon it, and the design should make it possible to increase its capacity whenever necessary without reconstruction of the work previously done.

Limited Access Highways

According to the laws of the State of New Jersey, abutting property owners have the right of access to the highways of the State. In principle and generally, this is entirely proper. However, when the traffic on a highway becomes so heavy that it is materially interfered with by vehicles entering or leaving at numerous private driveways, and when this heavy traffic in turn makes it difficult and dangerous for the abutting property owners to enter or leave the highways, it becomes a matter of public advantage to restrict the number of places, where a vehicle may enter or leave the highway. It would be of advantage, therefore, to amend the laws so as to authorize the construction of Limited Access Roads where warranted by the volume and character of the traffic.

Parkways

By a Parkway is meant in this discussion a highway winding through country found or made pleasant to the eye, and so protected that its pleasing aspects may not be interfered with or destroyed.

To attain this involves the acquisition of sufficient width of right-of-way to retain unspoilt the natural beauty of the scenery, as well as judicious landscaping to enhance this natural beauty.

Such Parkways, which naturally must be limited access roads, will be particularly fitting for highways used principally for recreational purposes, but it would be of advantage to provide them, wherever the conditions will permit in order to remove as much as possible the strain, fatigue and dullness, often connected with driving a motor vehicle.

Landing Strips

The State Highway System is not competing with any other methods or agencies of travel. On the contrary, its functions include assisting these wherever and whenever it can be done to the benefit of the people of the State. For this reason, the provision of Landing Strips for airplanes may well be considered to be properly within the functions of the State Highway Department.

A Landing Strip is a cleared and smoothly surfaced piece of land, which is immediately adjacent to a highway, and on which a plane may land when in trouble. More than that, however, the presence of landing strips, spaced at proper intervals along State Highways, will furnish needed confidence to fliers. Although they may not expect any difficulties on their flights, they will know that, if any should develop, they can find a safe place on which they may land. In other words, the value of the landing strips will not be measured by the number of landings actually made on them, but by the number of flights made because the landings strips are there for them to use in an emergency.

Aviation experts declare that the State Highways provide excellent landmarks to guide them in their travels. They say that the marking of route numbers in large lettering on the highways, as is now commonly done, already has been of material help to aviators. The furnishing of landing strips would be of even greater assistance in the development and safety of flying.

A landing strip may possibly be a little less than half a mile long and not less than 150 feet wide. Parts of these strips could be used for depots of highway maintenance materials and other field facilities needed by the Highway Department.

It is intended to include in this study the proper location and construction of landing strips.

Chapter 5

Post War Highway Work

Post War Work

With gratifying foresight, the New Jersey State Legislature has recently passed a bill, creating a commission under the chairmanship of Senator Howard Eastwood to study and to draft and submit for the consideration of the Legislature measures which may be taken by the State of New Jersey to guard against and forestall the effects of a possible depression following the termination of the present war emergency.

The Commission is intended to be a purely legislative agency with purely advisory functions. The legislative Act is designed to bring to bear the best thought in this State, both in and out of government, upon the social and economic problems that will be the aftermath of the war.

In the following will be outlined the measures which may be taken in connection with highway work and conforming with the intent of the Act.

Highway Work

There are two distinct types of work that have to be performed on any highway construction, whether it be large or small. The first type is generally carried out at some place away from the site of the project and includes the work required for producing, manufacturing and transporting the tools, equipment and materials in their various stages of completion from the raw condition in mines, quarries or pits to the finished products, as well as that required for preparation of working drawings, inspection, auditing, letter writing and other clerical work.

The second type involves the work of construction at the site of the project, including excavation, carpentry, steel erection, placing of concrete and other construction materials, operation of mechanical equipment as well as all kinds of white collar work.

It is evident, therefore, that in order to carry out a highway project, much work must be done in addition to that performed at the site of the project, Actually, most of the money spent on the construction of a highway is paid for labor done. The fact is, that the raw materials, whatever they may be, used in producing the finished highway, are nearly as free as the air we breathe. It is the human work required to produce, manufacture and move them, that gives them their essential and final value.

Previous Relief Work

At previous occasions, highway construction carried out as relief work has been limited in a large degree to purely manual field work, discouraging the use of mechanical equipment. Consequently, the cost of the construction was increased and many skilled workmen, that needed relief, were forced to do unskilled work.

It has been freely admitted that this method of carrying out the work was economically unsound, but there was no other choice because proper planning had not been carried out in sufficient detail to develop a comprehensive scheme on a sound economic basis.

Character of Post War Work

Post war highway work should not be relief work. Except when applied in relation to an emergency caused by an unforeseen calamity, the term relief work is in itself demoralizing.

On the contrary, post war highway work should be normal highway work forming part of a comprehensive plan for highway improvements and carried out as usual under contract by the State Highway or the local governments. The only difference should be that four, five or more times as much work should be planned and executed in one year as is ordinarily done.

In this manner, three important objectives will be attained. First, there will be ample work for those that need and want it; second, the work will not be classified as relief work; and, finally, highway improvements, which are badly needed right now, will be so much sooner completed.

The question may be asked: where will the money come from to carry out this intensive work? At present, this question cannot be answered, but it is quite certain that before the time comes, both the State and the Federal Government will have found ways to supply all the money necessary to carry out the work needed by those that have been relieved of their war duties to tide them over the time interval required for converting the present war efforts of the country into normal peacetime conditions.

Applicability of Highway Work

When the war is over, people will return from their war efforts to their homes and look for new work. The post war work, therefore, shall preferably be of such a character, that it can be carried out within reasonable reach of these homes. For this reason, highway improvement work is particularly applicable as post war work, as it is needed and can be made available in all parts of the State; and within the limits of practically every county and township there can be sufficient work to take care of the local needs.

It is possible that in some of the more densely populated places, for example in the urban areas adjacent to the Hudson River, there will not be sufficient work to employ all in the immediate vicinity of their homes. However, so much highway work is needed to be done in this part of the State, that it should be possible to employ the larger number directly on highway work in this vicinity. Indirectly, of course, many more may be employed in highway work in the many manufacturing plants within this area. Nevertheless, there may still remain the problem of employing some, for which there is no work available in the neighborhood. In former emergencies, this problem has not been satisfactorily solved.

It would seem, however, that with proper forethought, this problem could be solved. One possibility would be to establish and operate aerial bus lines between the places where the people live, and where the work is going on, and other methods should readily suggest themselves to those charged with the solution of this problem.

Plans for Highway Projects

It cannot be said too often, that it is insufficient to limit post war planning to the preparation of a program of work to be done and projects to be constructed. For the post war program to be of any use, the surveys must be made, the plans drawn and the specifications written for each individual project, so that the actual work can be started as soon as the war is over. In addition, for projects requiring new right-of-way, this must be available at that time; and any and all approvals of the projects required by Federal and State authorities or agencies must have been obtained by the time the war is ended.

As the post war work undoubtedly will continue over a period of several years it is, of course, not necessary to have the plans ready for the whole post war program as soon as the war is over, but the plans and other work as mentioned above must be ready for a sufficient number of projects for immediate use at the end of the war, and the remainder should be made ready in such a manner that the construction of additional projects can start as soon as may be necessary for continuous employment.

This means that plans and specifications for work involving the expenditure of at least one hundred million dollars should be ready as soon as the service men return from the wars, and additional work involving even larger expenditures should be made ready during each of the following years. This is much more than has ever been done by the combined efforts of the State Highway Department and the local governments, and at least for the first year's work the plans will have to be prepared with an engineering force greatly depleted by inductions into the armed forces or transfers to various kinds of war work. Nevertheless, this work has to be completed on time, and it is proper, therefore, to consider means of accelerating it.

Whenever embarking on a new highway project, it has been the policy of the State Highway Department to make complete surveys, computations and plans for the project, although some of this could be done and actually may be repeated, either by the Contractor on the project or by the Department's engineers in the field after the work is started. It is suggested, therefore, that a review be made of the design procedure with the purposes in mind of decreasing the amount of work and time now spent on the design of a project and increasing the total output.

Federal Approvals

During past years, a certain number of the projects prepared for highway construction have involved the use of federal funds, and for these projects the plans and specifications must be approved by the Public Roads Administration before the contracts can be let for the construction work. During the post war period it is certain that a much larger number of projects will involve the use of federal funds, not only in the State of New Jersey, but also in other States. The Engineers of the Public Roads Administration carefully examine the plans submitted before approval is given. It is evident, therefore, that these engineers now or shortly will have before them an unusually large number of projects for approval. Consequently, it is of first importance to submit our plans to them as soon and as rapidly as possible, so that their approval may be obtained before the time the construction work should be in progress. This, therefore, is another important reason for completing the plans without expenditure of time beyond that which is essential to make them fully intelligible.

Scope of Post War Work

In previous chapters of this report has been outlined the present and future highways needs in the State of New Jersey, both on the State Highway System and on other highways in the State. Any and all of the work required to satisfy these needs may be included in the post war program and should be included to the full extent necessary to furnish work to all that need and want it. This will not only be of immediate benefit to the post war workers, but it will be of permanent value to the State as a whole, because much needed highway improvements will be completed within a few years, which otherwise might be indefinitely delayed.

In the following will be indicated specific work which may be included in the post war program.

Work on State Highway System

Under date of April 15, 1943, the Construction Bureau of the State Highway Department submitted a tentative list of post war projects on the State Highway System. The list includes:

Route 1,	Improvement of intersection with Communipaw Avenue, Jersey City.
" "	Improvements at Bayonne.
Route 2,	Relocation from Route 6 to Route 7.
" "	Conversion to divided highway from Route 4 to Route 6, and from Ramsey to State line.
Route 3,	Secaucus Bypass.
Routes 3,10,25,	Connecting link to Lincoln Tunnel.
Route S-3,	Extension of Berry's Creek Bridge, grade separation at Route 3 and other work.
" S-3,	Construction from Clifton to Great Notch.
Route 4,	Construction from Woodbridge to Irvington.
" "	Freehold-Adelphia Widening.
" "	Improvements, Fort Lee to Route 2.
" "	Conversion to divided highway from Paterson to Route 2.
" "	Relocation at Cape May Courthouse.
" "	Toms River Bypass.
" "	Construction from Absecon to Somers Point.
" S4B,	Construction, Route 4 to Oakland.
Route 5,	Columbia Avenue Extension.
Route 6,	Denville-Delaware Relocation and other work.
" "	Construction from Little Falls to Pine Brook.
" "	Fort Lee to Little Ferry, conversion and other work.
" 6-A,	Construction, Dover to Sparta.
Route 10,	Belleville Turnpike to Whippany, right-of-way.
Route 18,	Construction, Old Bridge to Route 4.
Route 21,	Construction and Paving in Newark.
Route 23,	Construction, Smith Mills to Newfoundland.
Route 24,	Phillipsburg Bridge Approach.
Route 25,	Widening, Elizabeth to Raymond Boulevard.
" "	Reconstruction, Kaighn Avenue Circle to Camden Bridge Plaza.
" "	Reconstruction, Burnett Street Traffic Circle.
" "	Twenty-two Grade Separations.
" "	Bypass, Cranbury-Hightstown.
" "	Construction, Deans to Route 26.
" "	Widening and relocation, Bordentown to Robbinsville.
" "	Overpass at Baird Avenue.
" "	Center Island on Skyway.
Route 25A,	Construction, Newark to Harrison.

Route 26,	Extension through Trenton.
Route 28,	Reconstruction between Somerville and Still Valley.
Route 29,	Meeker Street to Newark Junction.
" "	Reconstruction, Chimney Rock to Somerville.
Route 30,	Relocation, Trenton to Pennington.
Route S31,	Reconstruction, Branchville-Ross Corner.
Route 35,	Overpass, N. Y. & L. B. R.R.
" "	Construction, Laurence Harbor to Keyport.
" "	Grade Separation, Sayreville.
" "	Widening near Route 4.
Route 38,	Improvements at Squankum.
Route S41,	Reconstruction, Palmyra Bridge to Route 38.
Route 43,	Absecon Bypass.
Route 44,	Westville to Paulsboro, construction.
" "	Paulsboro to Bridgeport, construction.
" "	Widening, Bridgeport to Nortonville.
Route 49,	Replacement of Bridge at Millville.
" "	Drainage project.
" "	Replacement of Bridge at Wildwood.
Route 54,	Hammonton Bypass.
" "	Construction from Route 45 to Route 48.
Route 56,	Reconstruction, Absecon Boulevard.
Route 100,	Right-of-way, Elizabeth to Fort Lee.
Routes 100 & S100	Construction, Woodbridge to Newark.

The total cost of this work is estimated at $124,175,000.

In addition to the above, the construction of Route 10 from Jersey City, through Newark and other municipalities to Whippany, and perhaps of other roads, is needed at the present time.

Furthermore, any part or all of the yet incompleted legislated State Highway System not shown in the list above, as well as the extension of the system outlined in this report, may advantageously be included in the post war program, and the total cost of this work will be well beyond the amount of money that may be expected to be needed for that program.

The final selection of projects to be included in the post war program should be decided not only on their desirability for use of traffic, but also on their location, so that a sufficient amount of work will be available at all locations throughout the State during the post war period.

Work on Other Highways

Throughout the State, there are many highways that are deficient due to insufficient shoulder width, type and width of pavement, alignment and other defects. The improvement of these roads should be an important item in the post war program.

The records of the Statewide Planning Survey, when their tabulation is completed, will furnish the necessary data for determining the deficiencies, and the local governing bodies should be invited to take part, not only in selecting the roads most badly in need of improvements, but also in carrying out most or all of the engineering work needed for the improvements. No records are available as yet for making an estimate of these improvements, but it is evident that the completion of even a part of them may readily amount to $20,000,000.

It has been stated previously that 717 bridges on the highways of New Jersey are deficient in capacity and that 704 other bridges are deficient in width. The survey by which this was determined covered only rural bridges over twenty feet in span. Bridges less than twenty feet in span as well as those in urban areas have not yet been surveyed, but it is certain that many of these also are deficient. The improvement of these bridges will form another important item in the post war program, and the total cost of their reconstruction may be well over $20,000,000.

The assistance of the County Engineers should properly be called upon in carrying out the engineering work connected with these improvements, but as many of the bridges will be similar in span and width, the same design can be used for the super-structure of a large number of bridges and may most readily be made by the Construction Bureau of the State Highway Department. As it is the function of the Water Policy Commission to determine the size of opening required for the flow of water under the bridges, and as the number of bridges is large, it is advisable to present to this Commission as soon as practicable the necessary data for determining the flow, so that there shall be no delay in making these determinations.

There are about 134 present grade crossings of railroads on highways not within the State Highway System, which according to the Public Utility Commission should be eliminated. This work should form part of the post war program, and the estimated cost of completion is about $35,000,000.

The highway bridges across the Delaware River under the jurisdiction of the Delaware River Joint Toll Bridge Commission have been mentioned previously in this report. The reconstruction of at least three of these bridges, including those at Calhoun Street, Trenton, at Wilburtha and at Columbia may properly form part of the post war program, and the cost of the work is tentatively estimated at $3,000,000.

Other Projects

In addition to the projects already mentioned, the post war program may include the following items:

Provision of hard surface sidewalks or sidepaths on highways.

Reconstruction of curbs and sidewalks in urban areas, where the present sidewalks are in bad repair.

Provision of landing strips for airplanes adjacent to State Highways.

On account of incomplete data on these matters, no estimate of cost can be given for these items at the present time.

Total Estimated Cost

The total cost of the projects for which estimates are given above amounts to more than two hundred million dollars. These projects should be planned so that not less than one-half of this amount will be ready for contract immediately after the war. The projects, for which no estimates are made, are expected to include sufficient work to cover the whole of the period during which post war work will be needed.

Research Work

Finally it may be added that in order to carry out the research and engineering work outlined in this report within a reasonable time, a sufficient number of persons, skilled in this type of work, and drawn from those that are in need of employment after the end of the war, should be temporarily engaged by the State and by the local governments to assist in its completion. It is better to make full use of their knowledge than to place them in some work that can be carried out by less skilled persons.

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